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ABSTRACT

Seychelles Integrated Science (SIS), a 3-year laboratory-based science program for students (ages 11-15) in upper primary grades 7, 8, and 9, was developed from an extensive evaluation and modification of previous P7-P9 materials. This P8 SIS unit examines: (1) the role played by bones, muscles, and teeth and the importance of developing and maintaining these body parts; (2) the biological reasons for eating food and how to best plan eating habits to fulfill these needs; and (3) the role of plants in feeding man and other animals. In addition, the development of skills in growing plants from seeds, stem cuttings, and tubers is emphasized. Provided for the unit is a student workbook and a set of teaching notes. The teaching notes include the general aims of the unit and a lesson plan for each topic area. Each lesson plan includes a suggested time frame, a list of objectives, a list of equipment needed, and a suggested lesson format. This format includes suggestions for introducing the lesson, instructional strategies (emphasizing procedures for student activities), and evaluation methods. The student workbook includes procedures for completing the unit activities and a list of new words keyed to page numbers in the workbook. (JN)

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seychelles integrated science

Unit 7

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TEACHING NOTES

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The Goals of Unit 7

In this Unit we look at some of the basic structures of the human body; the bones, muscles and teeth. Using the idea that different types of teeth have different functions we relate dentition to diet and so lead on to a study of the different food types and their importance in our diet.

After looking at food and diet we then go on to study food chains and the pivotal position of plants for all the food we eat. Finally we take a close look at how plants make their food and how we can use this knowledge and our knowledge of reproduction (from Unit 6) to grow more food.

Overall the Unit has four goals ;

(1) To make the pupils aware of the roles played by our bones, muscles and teeth and of why we need to develop and maintain these parts of our body in a healthy condition.

(2) To develop in the pupils an understanding and appreciation of the different biological reasons for eating food and of how we can best plan our eating habits to fulfil our biological needs.

(3) To foster in the pupils an awareness of the important role plants play in feeding all animals including man.

(4) To develop in the pupils basic skills in growing plants from seeds, stem cuttings and tubers and to encourage a positive attitude towards local food production.

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Lesson Plan

Unit 7 — Topic 1

Growing Up

Time — Three periods

Objectives — At the end of the Topic the pupils should be able:

(1) to measure the height of ten pupils and find their average height to the nearest cm,

(2) to plot a barchart relating pupils' height to age,

(3) to interpret a barchart of height against age,

(4) to measure their own height to an accuracy of $\pm$ 1 cm,

(5) from a barchart of height against age for P 1 to P 8 pupils, to estimate the average height of P 9 pupils.

Equipment — Each group will need a tape measure - or a height measure from the maths department, a meter ruler or twelve inch ruler and a piece of chalk.

Put up a brief notice in the staffroom or arrange with the other teachers for the pupils to visit the different classes.

Suggested Lesson Format

Introduction

Ask who is the tallest in the class and who is the smallest. Ask the tallest was he / she as tall last year as this year. Ask is anyone as tall as their mother and were they always as tall as her.

Activity

Tell the pupils that today you want them to find out how much pupils grow each year. Divide the class into groups of four or five. Then give them clear instructions on how they are to go to the different classes to measure the height of the first ten pupils on the class register.
Get one group of pupils to 'act out' for the class what they have to do. If your school has more than one stream we suggest that 8A measures the height of all the A streams and 8B measures the height of all the B streams etc.
Allow every pupil time to practice measuring their own height and the height of other people in their group and check that they can do this accurately before allowing them to begin with the other classes (Objective 1 and 4). Let the pupils carry out the activity.

Back in the classroom show each group how to calculate the average height and then let them do this for their results. Draw the table from 1.2 on the board and complete using each group's results.
Using the board explain how to draw the first three results on the barchart. Discuss the example in the book and then ask each individual to complete the barchart. You and the technician should move from individual to individual checking

their work (Objective 2). Ask individuals to interpret their chart, for example, by asking questions such as,

"Without looking at the table, but by reading the chart can anyone tell me the average height of P 5 pupils ?"

"If a pupil was 120 cm tall what class do you think he would be in P 2 or P7 ?" (Objective 3)

Discussion and Evaluation

Ask the pupils what do they think the average height of P 9 pupils would be. Allow each group a few moments to agree on a height. Then let them make suggestions and describe why they picked that height. Demonstrate on the board how to get - a straight line - estimate of the average height of P 9 pupils from the barchart (Objective 5). Let the pupils try this and then check and compare their answers.

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Lesson Plan

Unit 7 Topic 2

The Bones in Your Skeleton

Time Five to six periods

Objectives At the end of the Topic the pupils should,

(1) be able to explain in their own words that our skeleton helps to support our body, protect our organs from damage and helps us to move,

(2) know that a joint is a place where two bones meet and be able to identify all the joints in the arms and legs,

(3) be able to explain in their own words how the skull protects the brain and how the ribs protect the lungs and heart,

(4) be able to make a model of the muscles and bones of the arm and demonstrate how the muscles raise and lower the arm.

Equipment You will need a skull or some bones from an animal.

Each pair of pupils will need

- a sheet of A4 paper, glue, sticky tape or an elastic band , a pen or pencil , thread, and some weights (use things of approximately equal weight such as nails or washers).
- two sheets of A4 cardboard, two spent matchsticks, some string and the use of scissors.

Suggested Lesson Format

Introduction

Show the pupils the skull and bones. Let them handle and look at them and then ask a number of questions such as, "What are they ? - Where did they come from ? - Do we find them inside both dead and living animals ? - Do living animals have hard or soft bones ? "

Activity

Ask the pupils to try to feel the bones inside their own bodies. Let them look at 2.1 and the diagram of the skeleton. Ask them to see how many of the bones they can feel.

Let the pupils copy the diagram of the skeleton into their books and then label the bones with the words given in their books. Allow them some time to discuss with a partner how they will label each bone. You and the technician should move from pupil to pupil checking what they do and asking them to explain why they label the bones the way they do. Ask the pupils to discuss with their groups why we have bones. "What good are they ?" "What would happen if we didn't have any bones ?". Let one pupil from each group report their ideas. If one group suggests "protection" agree and then let the pupils all feel their their skulls and rib cages and ask them to say what the bones are protecting (Objective 3).

If any of the groups mention "support" agree and let the class carry out activity 2.3. Similarly praise any groups who mention the skeleton's role in helping us to move. Introduce the word joint and discuss the idea that a joint is a place where bones meet (objective 1 and 2).

Get the pupils to identify as many joints in their body as they can. Point out especially the joints in the arm and leg. Use simple terms such as, finger joint,wrist, elbow, shoulder joint, toe joint, ankle, knee and hip joint.

Let the pupil read 2.6 and feel their own arm muscles. Get them to draw a diagram of their arm bones and muscles and to label the biceps and triceps muscles.

Let the pupils read 2.8. Discuss with them what they are to do and then let them begin. Move from group to group checking that they are following the instructions correctly (Objective 4). Let the pupils take their models home with them, although you might like to keep the best one or two for display.

Discussion and Evaluation

Ask the pupils to discuss in groups what we should do to have healthy bones and muscles. We will be discussing vitamins and minerals and food types later in this unit, at this stage we merely want the pupils to suggest the need for exercise and food to develop muscles and the idea that eggs,milk,cheese and salt fish are 'good' for bones.

Finally check that the pupils have achieved Objectives 1, 2 and 4.

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Lesson Plan

Unit 7 — Topic 3 + Project 1

Looking at your Teeth

Time — Four to five periods

Objectives — At the end of the Topic and Project the pupils should ;

(1) be able to label on a diagram or drawing of a tooth, the pulp cavity, enamel, dentine, nerve and blood capillary,

(2) know that we have three main types of teeth - incisors, canines and molars,

(3) be able to identify the three types of teeth in their own or other peoples' jaws,

(4) Be able to identify the number of each type of tooth in the upper and lower jaws as shown in a 'dental chart' and be able to make a 'dental chart' of their own or a friend's jaw.

(5) Given the number of teeth individual pupils have be able to calculate the average number of teeth for pupils in the class. (In some classes the teachers may have to assist with the mathematics).

(6) be able to make a display model of a set of teeth.

Equipment — Each pupil will need

- an A4 sheet of 'The Tooth'
- use of scissors and felt tip pens, markers or crayons
- some glue or gum
- some plasticene, plaster, water and two beakers.

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For plaster use Plaster of Paris but if this is not available builders' plaster will do.

Suggested Lesson Format

Introduction — Ask has anyone in the class had a tooth taken out recently. Let one person describe to the class what happened - what it was like. Then question him/her on what the tooth looked like.

Activity — Let the pupils read 3.0 and 3.1, then give them the sheet on the structure of a tooth. Let them cut it out, colour it and paste it together.

Discuss with the pupils the different parts of a tooth and what function each part plays (Objective 1). You can then write six 'names' - cement, jawbone, gum, enamel, dentine and nerve and blood capillary on the board along with six 'mixed up' sentences and ask the pupils to write them into their books so that the correct sentance follows each word.

Ask the pupils to feel their own teeth with their finger tips and say how many different types of teeth they have. Don't discuss the functions of each type yet but simply identify the broad flat ones in the front as incisors, the pointy ones as canines and the large 'square' ones as molars (Objective 2).

Let the pupils look at the drawing on 3.3 and let them identify the different types of teeth (Objective 3). Talk about the number of each type of tooth they can see in the drawing, then make a chart as in 3.4. Let the pupils make a chart of their partner's teeth. Write the number of teeth each person has on the board. (objective 4). Discuss with the pupils how we could calculate the average number of teeth per person in the class. For slower classes you may have to do the calculation yourself. Don't worry as long as the

pupils realize what is meant by average (Objective 5). Discuss who is above average for the class and who is below average. Ask the pupils if they can suggest why some have more teeth than others. Try not to emb--arrass any pupil but draw a connection between not cleaning our teeth , eating lots of sweets and dental decay and loss of teeth.

Let the pupils read Project 1. Let one pupil demonstrate how to make the model, how to mix the plaster and pour it into the mould. Then let the rest of the class carry out the activity (Objective 6).

Discussion and Evaluation

Check the pupils' achievement of Objectives 1,2 and 3, orally. You can check achievement of Objectives 4 and 5 by setting some questions on the board. For example, draw a dental chart and ask the pupils, "How many molars has this person ?" "How many incisors?" and by giving them the number of teeth a group of ten people have and asking them to calculate the average number of teeth per person.

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Lesson Plan

Unit 7 Topic 4

Your Teeth and Your Diet

Time One or two periods

Objectives After they have completed this Topic the pupils should;

(1) be able to describe in their own words that
- incisors are flat and broad teeth used for scraping or cutting food,
- canines are sharp and pointed teeth used for sticking into 'chunks' of food.
- molars are large teeth with flattish surfaces which grind and crush food,

(2) be able to identify the correct meaning of the words carnivorous, herbivorous and omnivorous and be able to give one example of each type of animal,

(3) given a set of teeth or a drawing of these be able to identify whether the teeth came from an animal which was carnivorous, herbivorous or omnivorous.

Equipment You should try to obtain some teeth for demonstration for example, shark's teeth, sheep, cat, and if possible some animal skulls. Clean them with hydrogen peroxide or other disinfectant before allowing the pupils to handle them.

Suggested Lesson Format

Introduction

Pass around the different types of teeth that you have available. Try to make sure you have some canine, incisors and molars. Let each pupil feel each tooth and press their fingers on the top of each.

Activity

Ask the pupils to feel their own teeth and then to write a word description of each type of tooth; incisor, canine and molar.

Tell the pupilsto imagine they are about to eat lunch. They have a leg of chicken, some rice and a mango. Let them imagine that they are eating each of these and try to work out how each type of tooth is used to help us eat the food. Allow them time to discuss their ideas in groups of 3 or 4.

Let one person from each group report on their ideas. Summarize on the board the description and function of each type of tooth (Objective 1).

Let the pupils lock carefully at the teeth in the drawings in 4.2. Ask then what does a cat usually eat and how is this reflected in its teeth. Similarly ask how a sheep's diet is shown by its teeth. Discuss the 'names' we give to animals , (a) that eat plants, and (b) that eat flesh - other animals. Write the words herbivorous and carnivorous on the board. Get the pupils to name other herbivorous and carnivorous animals (Objective 2).

If you have any skulls pass them around or let the pupils come up to your desk to look at them. Label the skulls A,B, and C etc and let the pupils individually and secretly write down what type of animal the skulls came from - herbivorous or carnivorous.

Ask the pupils what would they write down if you showed them a human skull. Introduce the omnivorous for an animal that eats both plants and flesh (Objective 3).

Discussion and Evaluation

Sketch diagrams of incisors, canines and molars on the board. Get the pupils to draw these into their books and see if they can label them correctly. Write the words herbivorous, carnivorous and omnivorous on the board and then write the names of seven or eight different animals. Get the pupils to write down the three words into their books and what each of the words means. Finally let them sort out the animals and write their names beside the correct word. For example,
carnivorous - dog, cat
herbivorous - rabbit , cow

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Lesson Plan

Unit 7 Topic 5

The Food that You Eat

Time One or two periods

Objectives At the end of the Topic the pupils should;

(1) be able to explain in their own words that our food gives us energy, helps us to grow and keeps us healthy,

(2) given a block graph of the composition of our bodies be able to calculate the percentage of the body which is composed of water, protein, fat and carbohydrate and estimate the percentage of minerals and vitamins,

Equipment Each pupil will need the use of a ruler and the use of several coloured pens, markers or crayons.

Suggested Lesson Format

Introduction Ask the pupils to close their eyes and think of what they ate at their last meal. Let one or two pupils tell the class what they ate. Then ask them why did they eat what they did - what did they expect their food to do.

Activity

Divide the pupils into groups and ask them to make a list of the main reasons why we eat food.
Let each group report their ideas and summarize them on the board under the headings of ENERGY, GROWTH and HEALTH. (Objective 1)

Let the pupils read Section 5.2. More able classes may be able to 'read' the graph, with slower classes you may need to discuss how to read the chart.
Get the pupils to draw a man or woman into their books and shade in the (approximate) composition of the body that is made up from the different types of food.
Get them to write the percentages of each underneath. (Objective 2).

Discussion and Evaluation

Move around the class from pupil to pupil discussing their drawings and checking on how accuratly they have taken the 'percentages' from the graph. Ask individuals to show you how they got their readings.

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Lesson Plan

Unit 7 Topic 6

Testing Our Food

Time — Five to six periods

Objectives — At the end of the Topic the pupils should;

(1) know that we need carbohydrates and fats to provide us with energy, proteins for growth and minerals and vitamins to keep our bodies healthy,

(2) be able to carry out the starch test to test for the presence or absence of starch in a food,

(3) be able to carry out a test for the presence or absence of sugar in a food using Benedicts's reagent.

(4) be able to test for the presence or absence of fat or oil in a food using the grease spot method,

(5) be able to test for the presence or absence of protein in a food using Millon's reagent.

Equipment — Each group will need

6.0 three coloured pencils, markers or crayons,

6.1
- some starch solution (5 ml)
- some iodine solution (5 ml)
- two test-tubes

6.2
- some glucose or sucrose (sugar)(5ml)
- some Benedict's reagent (5ml)
  If you have no Benedict's , Fehlings solution will do but you must use glucose with this.
- a burner
- two test-tubes and a holder

6.3 - some margarine or fat
- a small piece of white paper

6.4 - some milk (or milk powder 5ml)
- Millon's reagent (2ml)
- a burner

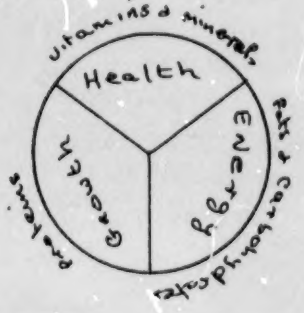
6.5 - a selection of 3 or 4 foods
e.g. coconut, bread, yams and cassava.

Suggested Lesson Format

Introduction — Revise with the pupils the work they did on the previous Topic. Discuss the reasons they gave for eating food, then lead from this to the three groups of food.

Carbohydrates .....energy
Protein .....growth
Minerals/Vitamins .....health

Activity — Draw on the board a logo or diagram to help the pupils remember the link between food types and their functions. A simple circle or catch word such as those below should help.



GEH

G .....► Growth
E .....► Energy
H .....► Health

Let the pupils draw these into their books and shade in the three parts using different colours.

6.1 Let the pupils read Section 6.1. Ask individuals to describe to the class what they are going to do. When you are sure the class understands let the groups carry out the activity. Move around the groups helping and checking their understanding.
Allow each group some time to discuss what happened and to prepare a written report of four to five lines.
Let one person from each group present the report to the class. Let the class correct or improve on these and then let each group write their own report into their books.
Repeat the same pattern for activities 6.2,6.3 and 6.4

Revise and summarize the findings for all four activities. Ask the pupils how we could use these test to discover the value or ingredients of different foods such as coconut. Allow them to plan an experiment to test a food stuff.

Set aside a double period and let the pupils carry out Activity 6.5. Let them test at least three different typs of food - one of which should not contain sugar. Each food should be tested by at least three groups.

Discussion and Evaluation

Draw a table on the board such as the one below

	Food type present			
	starch	sugar	protein	fat
coconut				
yam				
bread				
cassava				

Let one person from each group fill in the group's results on the board. Discuss the results and if necessary check and settle any disagreements. The let the pupils draw the chart into their books and write underneath in their own words an description or explaration of each food tested. Move around checking the pupils work as they write it up.

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Lesson Plan

Unit 7 Topic 7

Balancing Your Diet

Time one or two periods

Objectives At the end of the Topic the pupils should;

(1) be able to recall three locally produced foods which are
   (a) rich in protein
   (b) rich in carbohydrate
   (c) rich in minerals and /or vitamins

(2) be able to explain in their own words why
   (a) fish,meat,eggs and beans are important for our diet,
   (b) green vegetable and fruit are important for our diet,

(3) be able to plan a diet for a meal which will contain examples of each food type,

(4) be able to explain in their own words why it is important for us to include proteins,vitamins, minerals,carbohydrates and fats in our diet.

Equipment No equipment needed

Suggested Lesson Format

Introduction Ask the pupils what is their favourite food. Allow two or three pupils to tell the class what their favourite is and why it is their favourite.

Activity

Ask what would happen if someone ate nothing but their favourite food. Revise the circle picture on growth, health and energy. Discuss what would happen if we didn't eat either proteins or vitamins and minerals (Objective 4).

Ask the pupils if they know of any foods which are good for growth, i.e. rich in protein. Then allow the pupils time to work in groups to discuss their ideas on foods which are good for (a) growth, (b) energy and (c) health.

Let each group report. Summarize their ideas on the board. Let the pupils check their ideas against the table on page 14 (Objectives 1 and 2).

Ask each pupil to write down everything they ate the previous day. When each person has done this they should exchange their list with their partner and then the partner should classify each food item as being either rich in protein, carbohydrate (or fat) or vitamins and minerals.

Discussion and Evaluation

Move around from pupil to pupil checking on their understanding. Finally ask the pupils to use the table to prepare a menu for a main meal - one which would be a balanced meal and contain foods from the three main groups.

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Lesson Plan

Unit 7 — Topic 8

Food Chains

Time — one or two periods

Objectives — At the end of the Topic the pupils should;

(1) know that all our food is dependent ultimately on plants

(2) be able to construct at least two food chains (involving , plants, primary and secondary consumers)- one of which should include man.

Equipment — No equipment needed

Suggested Lesson Format

Introduction — Ask the pupils to think for a moment about the last main meal they had.
Let one or two pupils describe the meal and as they do so revise ideas about food types. Write the ingredients of the meal described on the board and then go through the list item by item asking the pupils to say what type of food it is.
Bring out the point that all the food we eat either comes directly from plants or from animals that ate plants.

Activity

Draw a simple food chain on the board based on one of the food items the pupils have suggested, e.g. people ⟶ cow ⟶ grass
Ask the pupils if anyone can draw a chain that does not include a plant. Allow a few pupils to draw some suggestions on the board and then encourage the rest of the class to show how the final link in the chain gets its food from a plant (Objective 1)

Write four or five skeletons of chains on the board and ask the pupils to complete them. Allow pupils to challenge the rest of the class to complete a chain - but make a condition that they must first be able to complete it themselves.

If you have a double period lesson you may then like to take the pupils out on a walk in the local area and ask them to construct food chains based on the animals and plants that they see. (Objective 2)

Discussion and Evaluation

Finally write three or four skeleton chains on the board and ask the pupils to complete them into their books. Move around the class checking on how they do this.

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Lesson Plan

Unit 7 Topic 9

Testing Leaves For Starch

Time Four to five periods

Objectives At the end of the Topic the pupils should;

(1) know that plants which have been in sunlight contain starch in their leaves but that plants which have been kept in darkness do not,

(2) be able to explain in their own words that plants need light in order to produce starch,

(3) be able to test a leaf for the presence or absence of starch,

(4) (more able pupils should) be able to design and carry out an experiment to test whether or not plants grow towards light.

Equipment You will need a piece of yam, breadfruit or cassava and some iodine solution

Each pair of pupils will need

- a leaf from a plant which had been kept in sunlight,
- a leaf from a plant which has been kept in darkness for two to three days,
- a beaker, a test-tube, tweezers, some methylated spirit (clear)
- some iodine solution

For demonstration you will also need two or three pot plants.

Suggested Lesson Format

Introduction

Ask the pupils if anyone can remember how we tested food to see if it contained starch. Ask the pupils to write down in the back of their book what to do and not to let anyone else see what they have written. Let the pupils then swop books with a partner and get one or two people to call out what their partner has written. Avoid embarassing any pupils who are wrong but rather praise them for what they have got right .

Activity

Revise the idea of man's dependence on plants as the ultimate source of all our food. Use the yam or breadfruit to remind the class that plants have starch. Ask the pupils to suggest where the plants got their starch from. Allow one or two pupils to suggest ideas to the rest of the class. Show the pupils the two plants that you have - one in sunlight - the other still in darkness. Then ask the pupils to read 9.1 to 9.6.

Let one pupil demonstrate to the class what they are to do. When you are satisfied everyone understands let them carry out the activity in their groups. Get them to record their result and discuss it with you and then let them repeat the experiment only this time using the leaf from the plant which has been kept in darkness.

Discussion and Evaluation

Let each group discuss their results with you. Then let them suggest reasons why they found starch only in the plant which had been in sunlight (Objectives 1, 2 and 3).

Get all the pupils to prepare for the next Topic (Section 9.8). You should set up some controls -

a plant pot with a pencil or twig covered with a plastic bag.

With more able pupils you should allow them to plan and discuss and then carry out Activity 9.9 on how to test whether or not plants will grow towards light. Try to let the pupils think and test their own ideas rather than give them a set experiment directly from a text book (Objective 4).

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Lesson Plan

Unit 7 Topic 10

Plant Leaves and Water

Time Four to five periods spread over a week or more

Objectives At the end of the Topic the pupils should

(1) know that green plants make their food from sunlight, air and water and that this is called photosynthesis,

(2) know that green plants need air, light and water in order to make their food,

(3) know that stomata are tiny 'holes' in leaves,

(4) be able to explain in their own words that plants 'breathe' in air and transpire (sweat) water through their stomata,

(5) be able to prepare a microscope slide so that they can look at stomata (or varnish impressions of stomata) under the microscope,

(6) be able to design and carry out an experiment to find out how long a plant will take to wilt if it is not watered.

Equipment Each group will need

- a microscope and slide
- a leaf
- a beaker, burner and tweezers
- some nail varnish (optional), clear varnish is best

You will also need two or three pot plants for 10.5

Suggested Lesson Format

Introduction	Ask the pupils what they do if they are hungry. The ask what would they do if they were lost and were hungry - e.g. landed on an island where nobody lived. Develop the idea that they would walk around or move about looking for food. Ask them if a plant gets hungry - what does it do. Bring out the idea that plants can not move around to look for food but must stay in one place and make their own food.
Activity	Revise Topic 9 on how to test leaves for starch. Ask the pupils to suggest reasons why the plant should be making starch in its leaves. Allow them a few minutes to discuss this in their groups and then get each group to produce a 'statement' about it. Let each group give their 'statement' to the class. Choose one of these statements and get the whole class to write it down into their books. Let the class discuss what the plant needs to make its food and then introduce the word photosynthesis. Again let the pupils produce their own definition, meaning, of the word photosynthesis and write it into their books (Objective 1 and 2). Get the pupils to look at the plant(s) they covered with the plastic bag during Topic 9 and at your controls. Ask them to describe what they see on the inside of the bag. If they have any difficulty deciding what this is you can show or talk about what happens when we lift a cold bottle out of a fridge- don't discuss condensation only the idea that water in the air forms a thin film on the bottle. Ask the pupils to compare the plants with the control and then to suggest why the water is only in the bag with the plant. Allow them a few minutes to discuss this in groups and then let the groups report

their ideas. Bring out the idea that the leaves must have little 'sweat' holes to let the water pass out and to 'breathe' in air (Objective 3 and 4) Let the pupils then carry out activity 10.2 and during the activity introduce the word stomata.

Demonstrate how to do 10.3 and then let the pupils carry out the activity themselves (Objective 5).

Discussion and Evaluation

Divide the pupils into their group and ask them to draw up and write a report - as a group - on all that they learned today. You and the technician should move from group to group helping them with words and phrases and checking their understanding. Let each group read out its report and then write it into their books. You might also like to display the best reports with a drawing on the laboratory wall.

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Lesson Plan

Unit 7 Topic 11

Germinating Seeds

Time — Five to six periods - but these may need to be spread out over two weeks

Objectives — At the end of the Topic the pupils should ;

(1) be able to carry out an investigation to decide the conditions for germination of a pea or bean seed,

(2) given the results of the above experiment be able to intrepret the data and conclude what conditions are necessary for germination

(3) be able to draw and label a diagram of the internal structure of a bean seed and to identify the embryo, seed coat and food store

(4) know that seeds will always grow so that the roots grow down and the stem grows upwards,

(5) know that as the seedling plant grows it uses up food from the food store of the seed.

Equipment — Each group or pair of pupils will need

11.1 - 4 test-tubes
- some cotton wool
- a little kerosene or cooking oil (1 ml)
- 8 bean seeds (Bush bean or other small seed)

11.5 - some iodine solution

11.7 - a jam-jar or beaker
- half a sheet of A4 paper
- some soil or washed sand or saw dust
- 4 or 5 bean seed (soaked overnight)

Suggested Lesson Format

Introduction

Write the word photosynthesis on the board and ask the pupils if they can remember what it means. Don't look only for a definition but rather as explanation in the pupils' own words. Pass around a few seeds and ask the pupils if these can photosynthesise

Activity

Discuss how the seeds can't photosynthesise until they have first germinated and produced some leaves. Ask the pupils if they can suggest what we have to do to a seed to make it germinate. When they suggest planting it in the ground ask them to explain why, "will the seed only germinate in the dark? Can it not germinate if there is light?"

Let the pupils discuss how we could find out if a seed,
(a) must have darkness to germinate,
(b) must have water to germinate,
(c) must have air to germinate.
Let the pupils read Sections 11.0, 11.1 and 11.2. Let them describe what each tube is meant to show. Then let them set up the experiment in groups.

Let each individual look at the bean seed (11.3). Ask them to squeeze it gently and describe what happens. Demonstrate how to peel off the seed coat and tell the pupils to do this and then to look carefully at the inside of the seed.
Let the pupils draw their own diagrams of what they see. Only afterwards should you draw a diagram on the board. The label and discuss the embryo and seed coat (Objective 3)

Let the pupils read and carry out activity 11.5 and then describe to you what they have learnt from this activity.

When the seeds you have set up in Activity 11.1 have germinated ask the groups to explain what the results for each tube mean and then to produce a 'statement' saying what a seed needs to germinate. Let them write their results and conclusions into their books (Objective 2)

Tell the pupils to read Sections 11.7 and 11.8 and then discuss in groups what they are going to do. Allow one group to demonstrate and let the others judge whether or not they are correct. Let all the groups carry out the activity. Make sure that they plant some of their seeds 'upside down'.

Encourage the pupils to keep a drawing and written record of what happens. Let each group prepare a poster and written explanation of what happened. (Objective 4 and 5)

Discussion and Evaluation

This is a long Topic so when you have complete all of the activities we suggest you get the different groups to discuss and prepare reports on what they have learned from the Topic. Let each group present its report and then write it up into their books. Also try to allow the pupils to transplant some of their seeds into the agriculture plot.

-------oooOooo-------

Lesson Plan

Unit 7 Project 2

Vegetative Reproduction

Time Two to three periods

Objectives At the end of the Project the pupils should;

(1) know that we can grow plants from stem cuttings and tubers aswell as from seeds

(2) recall two local economically important plants we can grow from (a) stem cuttings (b) tubers e.g. (a) pumpkin, cassava and sweet potato (b) sweet potato and yam,

(3) be able to take and plant stem cuttings of either sweet potato or pumpkin or cassava,

(4) be able to plant tubers of either sweet potato or yam.

Equipment You will need some iodine solution
Each group or pair of pupils will need;

- a sweet potato plant from which to take cuttings
- a razor blade, (a dissection blade or sharp knife)
- two or three sweet potato tubers

● Make sure your technician has the ridges ready for planting.

Suggested Lesson Format

Introduction On the day before you introduce this Project ask the pupils to try to bring in some banana or pine apple seeds. At the start of the Project ask the pupils to bring up their seeds. Then ask has anyone ever planted banana or pineapple seeds. From this ask how then do we get new banana and pineapple plants.

Activity

Take the pupils out to the agriculture project and either demonstrate or get the technician to demonstrate how to take a stem cutting of a sweet potato (or other plant) and then plant it. Then make sure every pupil is able to take a cutting and plant it. Let the technician then discuss and demonstrate how to take stem cuttings from other plants (Objectives 1, 2(a) and 3).

Show the pupils the sweet potato tubers and ask them what would happen to them if we didn't eat them. Bring out some iodine solution and let one or two pupils cut open a tuber and 'test' it to see if it contains starch. Ask the pupils to suggest reasons why they think plants grow tubers (Objective 1)

Demonstrate how to plant a sweet potato tuber and allow each pupil to plant at least one. Get the technician to show the pupils tubers of other plants (Objectives 1, 2(b) and 4).

Discussion and Evaluation

Back in the classroom ask one or two individuals to summarize for the class what they learned today about (a) stem cuttings, and (b) tubers. Then let the pupils write up what they did - if necessary using key words from the board. You and the technician should move around from pupil to pupil checking their achievement and understanding.

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SEYCHELLES INTEGRATED SCIENCE

Unit 7

SE.045066

FOOD AND GROWTH

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THE MINISTRY OF EDUCATION AND INFORMATION

R E P U B L I C O F S E Y C H E L L E S

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UNIT 7

TOPIC 1

GROWING UP

1.0 Ever since you were small, you have probably heard people telling you that you have grown. You will probably grow still taller in the next few years. Now, however, we shall look at how much you have grown since you first went to school.

1.1 In a small group visit another class in the school. Ask the teacher what age the pupils in that class are. Ask the teacher's permission to measure the heights of the first ten pupils on the register.

Add the heights together. Divide the total by ten.

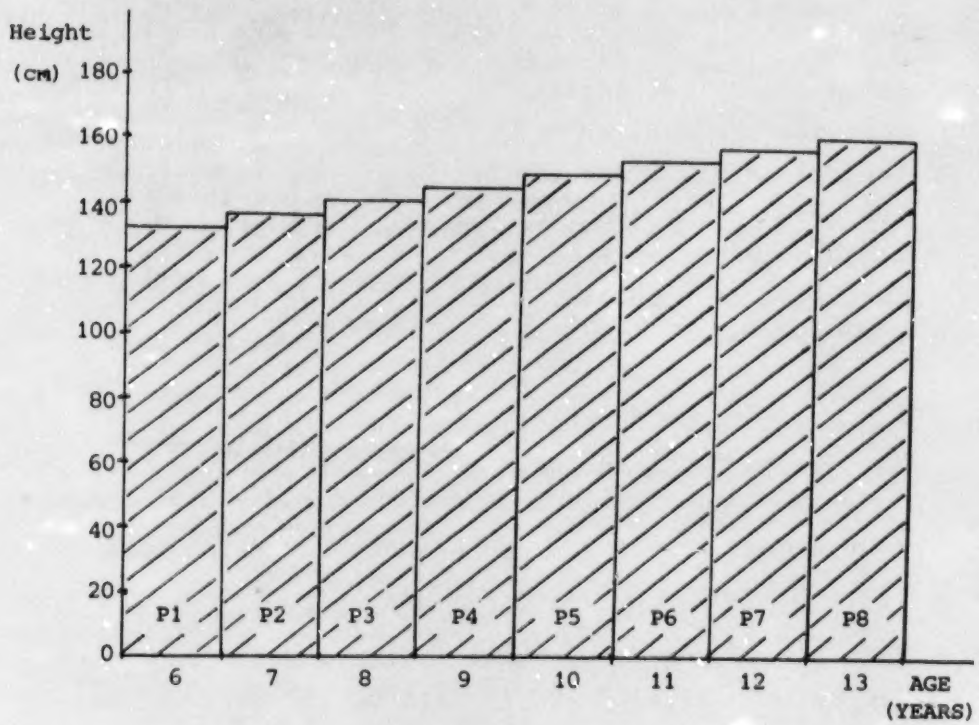
Your answer is the average height of the ten pupils.

1.2 When all of the groups have their results ready, you can make a table of the results of the whole class:

CLASS	P1	P2	P3	P4	P5	P6	P7	P8
AGE (YEARS)								
HEIGHT (cm)								

1.3 You can use the table of results to make a bar chart. On the horizontal axis (bottom line), write the age of the pupils. Each bar should then show the average height for the ten pupils of that age.

An example is shown below:



1.4 Measure your own height. Are you above or below average for your class ?

1.5 Explain how you could use your graph to estimate the average height of ten P9 pupils. How much taller do you think you will be next year ?

UNIT 7

TOPIC 2

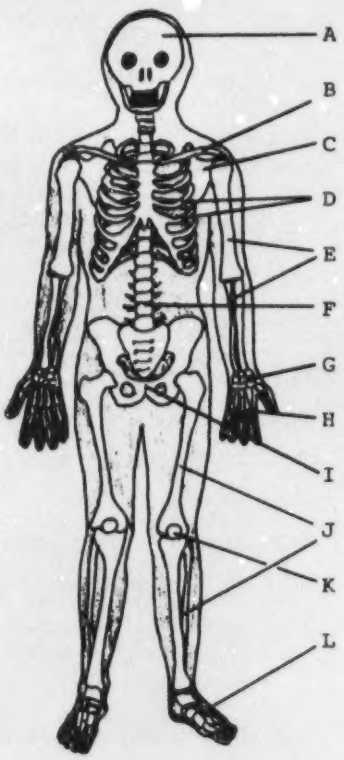
THE BONES IN YOUR SKELETON

2.0 When you were a baby, the milk that you drank helped you to grow. In particular, the milk helped your bones and teeth to grow. You have grown taller as the bones in your skeleton have grown longer. However, your bones do more than just help you to grow taller.

2.1 The picture below shows the different bones of your skeleton inside your body. With your hands, try to feel all of the bones shown in the picture.

Draw your own diagram of a skeleton in your book. Label your own diagram with the names of the bones shown:

arm bones, backbone, collar bone, bones of the foot, bones of the hand, knee bone, leg bones, pelvis, ribs, shoulder bones, skull, wrist bones.



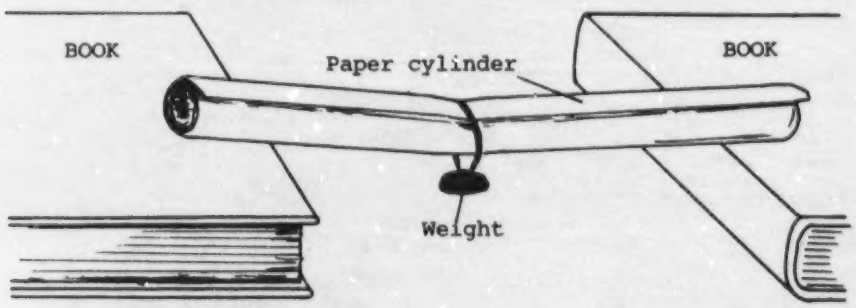
UNIT 7

TOPIC 2

THE BONES IN YOUR SKELETON

2.2 You are able to feel your bones under your skin because they are hard. Feel your skull and your ribs; what is inside these bones ? Why do you think it is important to have these bones ?

2.3 Many of the bones in your skeleton not only help to protect parts of your body, but they also help to support your body. You can make a model to show how your body needs bones to support it:



Roll a sheet of paper to make a cylinder. Stick down the end so that it cannot unroll. Lay it across two books which are a little way apart. Find out how much weight you can hang on it before it collapses.

Now repeat this, but put a "bone" inside the cylinder. You can use a pencil as a "bone". Describe the difference that having a bone makes.

2.4 In your model, the paper cylinder represented a part of your body, and the pencil the bone inside it. Discuss which bones are supporting your weight when

- you are sitting down
- you are standing up
- you are lying down

UNIT 7

TOPIC 2

THE BONES OF YOUR SKELETON

2.5 We are able to move different parts of our bodies because there are joints between our bones. A joint is a place where two bones meet. At some joints, there is a large amount of movement. At some other joints, only slight movement is possible.

Move as many parts of your body as you can, one at a time. Describe which of your joints allow most movement, and which allow least movement.

2.6 Your elbow is one joint which moves easily. You are able to move your forearm up by using your biceps muscle. You can move it down again with your triceps muscle.

Feel these muscles in your upper arm. Describe what happens to them when you

- lift your hand to press hard on your shoulder
- make your arm as straight as you can.

2.7 Discuss what you think gives you healthy bones and muscles.

THE BONES IN YOUR SKELETON

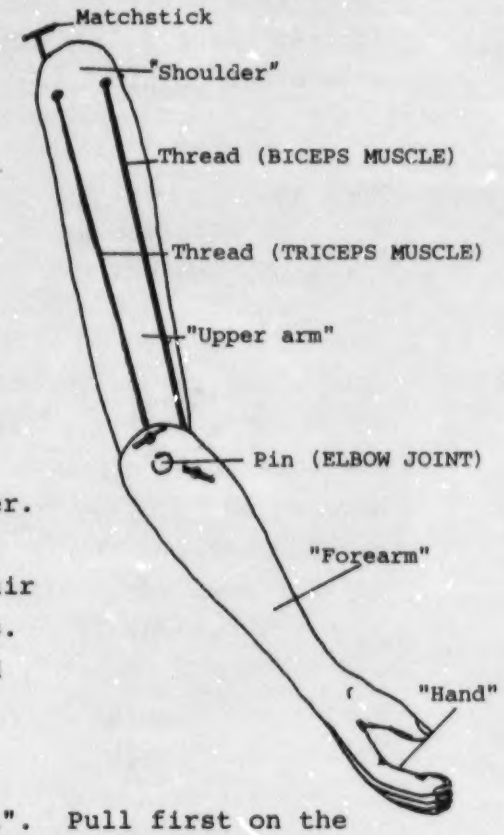
2.8 You can make a model of the way your arm moves at the elbow joint:

Cut out the shape of your forearm from a sheet of card. Also cut out the shape of your upper arm. Pin the two together, as the picture shows.

Make 2 holes in the forearm - one before the joint, and one behind the joint.

Make 2 holes near the shoulder.

Pass a thread through each pair of holes as the picture shows. Tie matchsticks onto each end of the thread.



2.9 Hold your model at the "joint". Pull first on the "biceps" muscle. Describe what happens. Now pull on the "triceps" muscle and describe what happens.

Draw a labelled diagram of your model into your book.

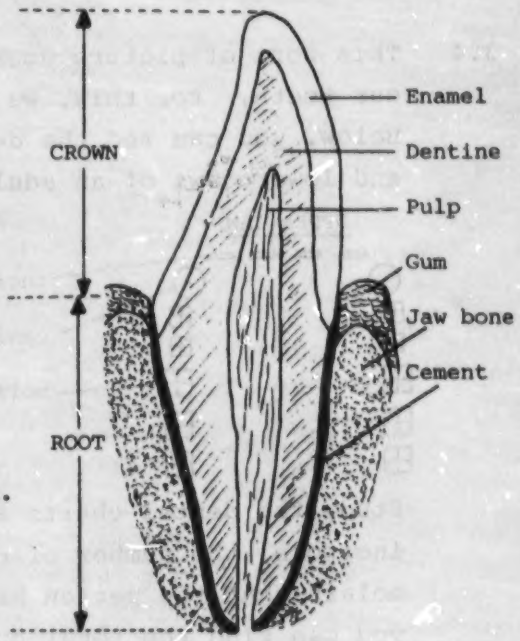
LOOKING AT YOUR TEETH

3.0 As a new born baby, you did not need teeth because your only food was milk. That milk helped you to grow your first set of 20 teeth. Since you were 6 years old, you have been replacing your first set with a second set of 28 teeth. When you are fully grown, you may have another 4 teeth as well.

3.1 Look at the picture on the right. It shows the structure inside one of your teeth.

Which of these parts can you see when you look at your own teeth ?

Make your own labelled diagram of the structure of a tooth, and colour it.



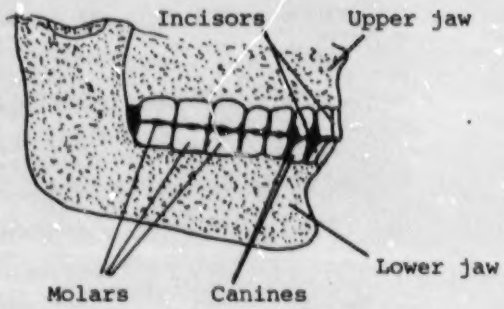
3.2 The picture shows only one of the types of teeth that you have - an <u>incisor</u> tooth. You also have other types called <u>canine</u> teeth and <u>molar</u> teeth.

UNIT 7

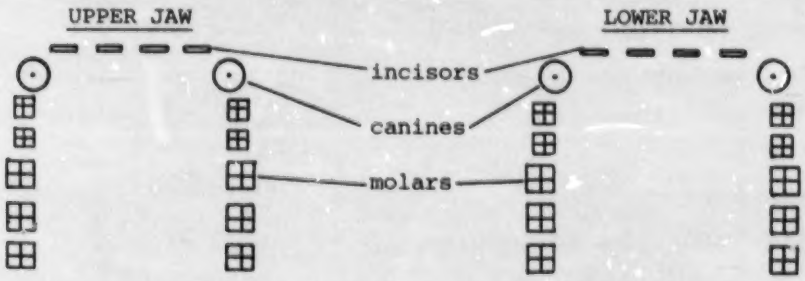
TOPIC 3

LOOKING AT YOUR TEETH

3.3 The picture here shows the jaws of an adult person from the side. Look at the picture, and use it to identify the incisors, canines and molars in your own jaw.



3.4 This sort of picture does not however, show all of our teeth. For this, we can make a dental chart. Below, you can see the dental charts for the upper and lower jaws of an adult person.



Study the dental charts and write down the number of incisors, the number of canines, and the number of molars that the person has. Add all of these, and you can find the total number of teeth of this person.

3.5 Now let a friend examine your teeth. Make dental charts for your own teeth, and find the total number of teeth that you have.

Find the average number of teeth that pupils in your class have. Compare the class average with the total number of your own teeth.

Discuss why some pupils have more teeth than others, and how we can keep our teeth healthy.

UNIT 7

PROJECT 1

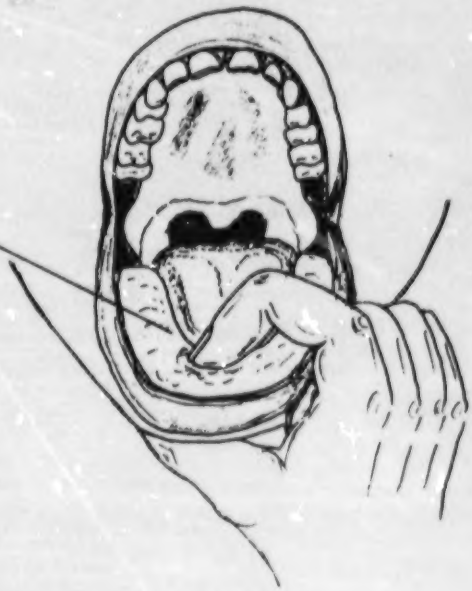
LOOKING AT YOUR TEETH

1. You can make a model of your own teeth as follows.

   First, make a large piece of plasticene into a "U" shape.

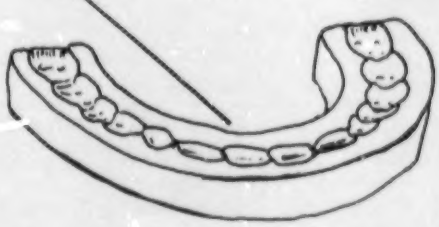
   Press it down over your teeth. Then, very carefully, lift it off. You should be able to see an impression of your own teeth in the plasticene.

   You can repeat the same process with the teeth in your upper jaw.



2. Fill the spaces where your teeth were in the plasticene with a mixture of plaster and water.

   Leave the plaster to set in the plasticene "mould" for one or two days until it is quite hard.



3. Finally, take off the plasticene carefully. You will now be able to paint your model teeth.

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UNIT 7

TOPIC 4

YOUR TEETH AND YOUR DIET

4.0 In Topic 3, we studied our different types of teeth. Now we shall find out more about why we have different types of teeth.

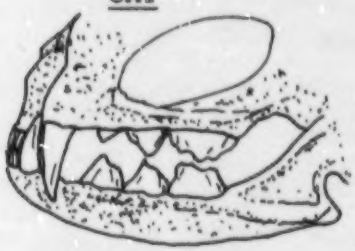
4.1 Look at the teeth of a friend, or at your model teeth from Project 1. Describe in your own words the shapes of an incisor, a canine and a molar tooth.

Think of a time when you would use each type of tooth. Describe what you would be eating in each case.

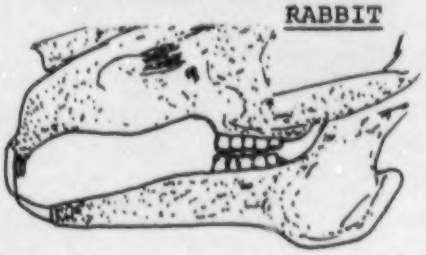
If you were a vegetarian (a person who eats only vegetables), which type of tooth do you think you would use least ? Give a reason for your answer.

4.2 Look at the pictures of the teeth and jaws of a cat and a rabbit. Describe any differences you can see:

CAT



RABBIT



4.3 Different animals have different types and arrangements of teeth because of their diet. Herbivorous animals, like rabbits, eat only plants. Carnivorous animals, such as cats, kill and eat other animals. Discuss and then describe how the teeth of the cat and the rabbit suit their diets.

THE FOOD THAT YOU EAT

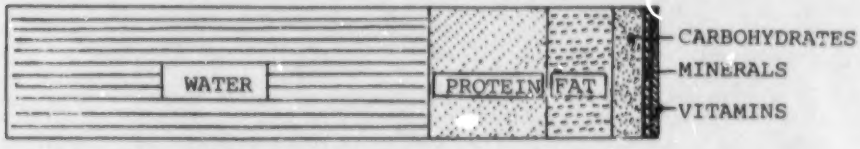
5.0 We have learnt that food helps us to grow our bones and our teeth. However, this is not the only reason why we eat food. All parts of the body need food for growth and repair. Food can also give us energy and keep us healthy.

5.1 Make a list of all of the food that you eat in one day, for example yesterday.

Compare your list with your friends'.

Discuss which foods we eat and drink most often. Suggest why we eat many different foods.

5.2 Everything in your body has been made with the food that you eat. The picture below shows what your body is made of:



Measure and write down the percentage of each type. If you measure your weight in kilograms, then you can use the chart to find the weight of each in your body.

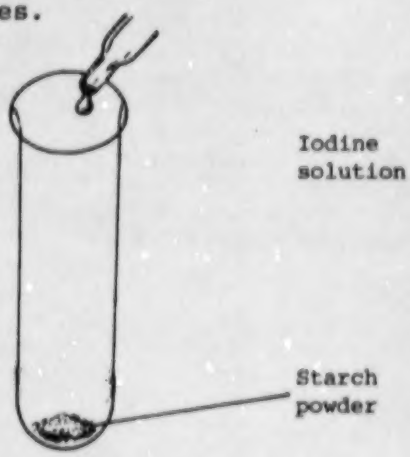
UNIT 7

TOPIC 6

TESTING OUR FOOD

6.0 The carbohydrates and fats in our body help to give us energy and to keep us warm. The proteins help us to replace worn out cells and to grow new ones. Minerals and vitamins keep us healthy. Water is essential for everything in our bodies.

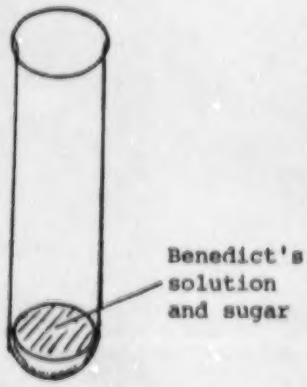
6.1 One of the carbohydrates that we eat is called starch. We can do a simple test which can show if a substance contains starch.



Put a little starch powder into a test-tube. Add some iodine solution.

Describe what happens. Discuss how you could use this test to find out which foods contain starch.

6.2 Sugar is another carbohydrate that we eat. We can use a different chemical to test for sugar.



Carefully heat 2 ml of "Benedict's solution" with a little sugar in a test-tube. Use a small flame.

Describe what happens. How could you use this result to find out if the food that you eat contains sugar ?

UNIT 7

TOPIC 6

TESTING OUR FOOD

6.3 We can also test for fat. Put some oil or margarine onto a sheet of paper and rub it into the paper.

Let the paper dry, and then hold it up to the light.

Describe what you see, and explain in your own words how you could use this idea to test a food for fat.

6.4 We can use a chemical called Millon's reagent to test for protein. <u>You must be very careful with Millon's reagent because it is dangerous to heat it too strongly.</u> Put 2 ml into a test-tube with a little milk powder. Heat it gently. Describe what you see.
(If you see a pink colour, this means that there is protein in the food that you are testing.)

6.5 Now you can try out these tests on different foods. Choose one food that you eat. Break it into very small pieces. Use a little of the food for each of the tests; describe and explain what happens.

<u>Starch test</u>: - add some iodine solution to the food.

<u>Sugar test</u>: - heat the food with a little Benedict's reagent.

<u>Protein test</u>:- heat the food with a little Millon's reagent.

<u>Fat test</u>: - rub the food onto paper and let it dry.

UNIT 7

TOPIC 7

BALANCING YOUR DIET

7.0 Your diet is the food that you eat regularly from day to day. It is important that this food has a balance of all the types of food for your health, growth and energy.

7.1 In the table below, you can see the amounts of each type of food in some of the things that we eat:

FOOD	PROTEIN	MINERALS	VITAMINS	FATS	CARBOHYDRATES	WATER
FISH	20 %	*****	*	1 %	not known	79 %
RICE	7 %	**	*	1 %	79 %	13 %
MILK	4 %	*******	*	4 %	5 %	87 %
BREAD	8 %	******	*	2 %	50 %	40 %
RED MEAT	18 %	***	**	22 %	not known	60 %
GREEN VEGETABLES	1 %	********	******	not known	3 %	96 %
SWEET POTATO	2 %	******	***	1 %	27 %	68 %
CITRUS FRUITS	-	*	***	not known	3 %	97 %
EGGS	13 %	**********	*	11 %	not known	76 %
CHICKEN MEAT	19 %	****	**	7 %	not known	74 %

➡ The more * there are, the more minerals/vitamins there are.

7.2 A balanced diet is one which can give you a balance of the minerals, vitamins, proteins, fats, carbohydrates and water that you need. Discuss why, for example, it is important to include green vegetables in our diet.

7.3 Look at the table and then write down two different menus that would give you a balanced meal.

UNIT 7

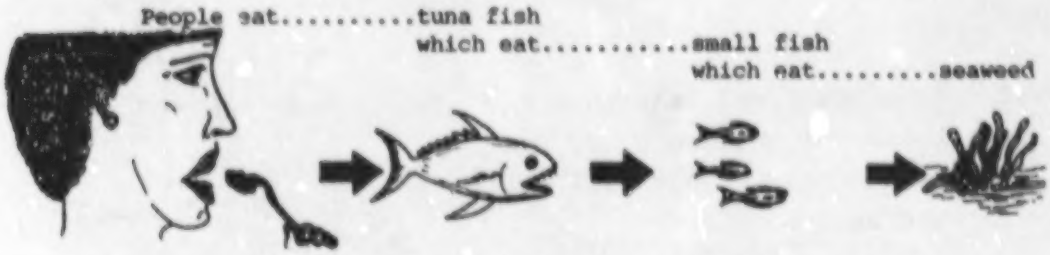
TOPIC 8

FOOD CHAINS

8.0 Most of the food that we eat comes from plants, either directly or indirectly. For example, we get our fruits and vegetables directly from plants. Our meat and fish either come from a herbivorous animal, or from one that eats herbivorous animals.

In either case the herbivorous animal eats plants; so we depend indirectly on those plants for that animal's meat by way of a food chain.

8.1 Here is an example of a food chain:



At one end of any food chain there will be a plant or plants. At the other end, there will be an animal that is carnivorous.

Copy and complete the following food chains:

PEOPLE....._____.....GRASS

_____.....BIRDS....._____.....PLANT LEAVES

MASON WASP....._____....._____

8.2 Make up some food chains; you can either write the names of the animals and plants, or you could draw a chart of them.

UNIT 7

TOPIC 9

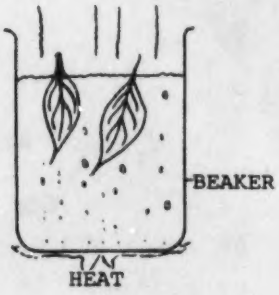
TESTING LEAVES FOR STARCH

9.0 We have learnt that we depend on plants for our food. Now we shall try to find out more about how plants get their food.

9.1 We shall test some plant leaves to see if they have any starch in them, as many of our vegetables contain starch.

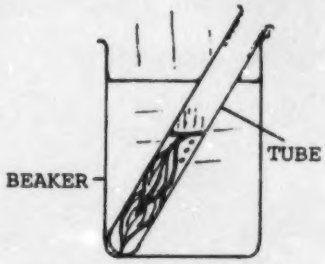
Take one leaf from a plant that has been growing in the light. Later, you will also need to test a leaf from a plant that has been in a dark place for a few days.

9.2 Drop the first leaf into a beaker of boiling water for two minutes. This will kill the cells.



9.3 Turn off the heat. Make sure that there are no flames near to your apparatus.

Put the leaf into a test-tube of ethanol (alcoholic spirit). Put the test-tube into the beaker of hot water for a few minutes.

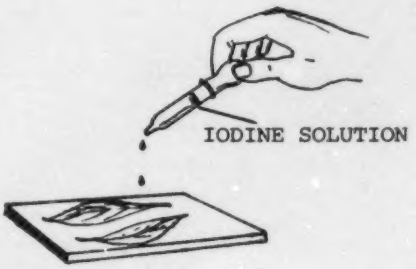


9.4 Describe what happens when you put the leaf into the ethanol. Try to suggest a reason why we do this.

TESTING LEAVES FOR STARCH

9.5 Take the leaf out of the ethanol. Wash it with cool water to make it soft. Put it on a flat surface.

9.6 Drop iodine solution on to the leaf. Wait for a few seconds to let the solution enter the leaf.



9.7 Record the results that you get with
- the leaf from the plant in the light
- the leaf from the plant in the dark.

Try to explain any difference in the results that you get.

9.8 Take a plastic bag and cover the plant leaves with it. Leave it until your next science lesson.

9.9 Discuss how you could find out if plants will grow towards the light. You may try to carry out your own project to find out if this is true.

UNIT 7

TOPIC 10

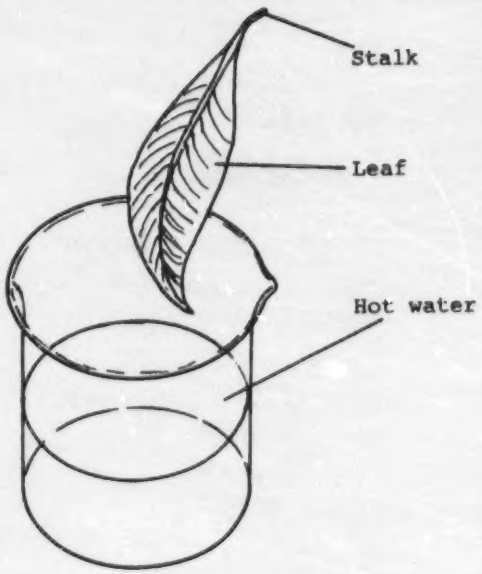
PLANT LEAVES AND WATER

10.0 In Topic 9 we found out that there is starch in the green leaves of a plant that has been in sunlight. This starch is food that the plant leaves make by PHOTOSYNTHESIS. A green plant needs light, air and water to photosynthesise. The leaves get their light from sunlight during the day. Now we shall try to find out how they get their air and water.

10.1 Look at the plant that you covered with a plastic bag in your last lesson.

Describe what you can see on the inside of the plastic bag; explain this.

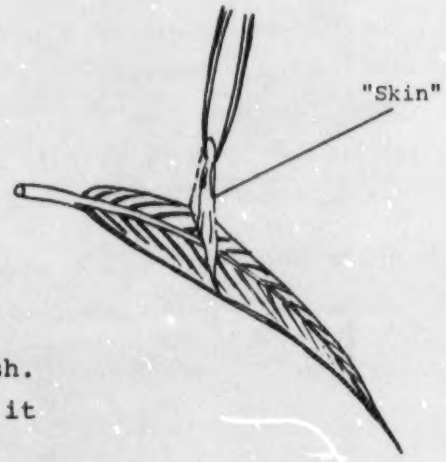
10.2 Heat some water in a beaker so that it is hot, but not boiling. Hold a leaf by its stalk. Put it into the hot water.



Describe what you can see coming from the leaf. Try to explain this.

PLANT LEAVES AND WATER

10.3 EITHER Using tweezers or your fingernails, carefully pull the "skin" from the underside of a leaf.



OR Paint the underside of a leaf with a "skin" of nail varnish. When it is dry, pull it off with tweezers.

Look at this skin from the underside of the leaf with a microscope. Make a sketch drawing of what you can see.

10.4 You may have been able to see where the stomata are in the skin of the leaf. Stomata are tiny holes between the cells in the leaf skin.

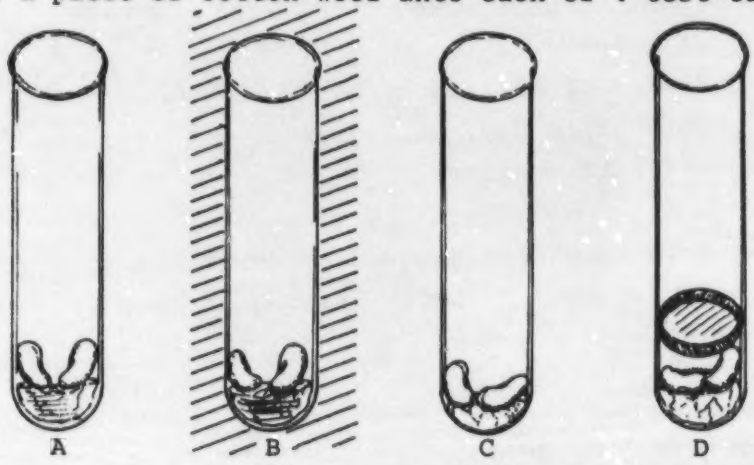
Now look again at your results from 10.1 and 10.2. Try to explain these results in your own words.

10.5 Plants not only need water to make their own food, but also to support their cells. Design and plan an experiment which will help you to find out how long a plant takes to wilt without water. Discuss your plan with your teacher. Record your results, and describe what happens to the plant as it loses water.

GERMINATING SEEDS

11.0 The green leaves of a plant can make food by photosynthesis. However, the seeds of a plant have no green leaves. We shall now try to find out more about how a seed germinates (starts to grow).

11.1 Put a piece of cotton wool into each of 4 test-tubes:



Label the tubes A, B, C and D. Put two bean seeds into each tube, and then -

for Tube A - pour a little water in to make the cotton wool wet. Put the tube in the light.

for Tube B - pour a little water in to make the cotton wool wet. Put the tube in the dark.

for Tube C - leave the cotton wool and the seeds dry. Put the tube in the light.

for Tube D - pour in some water with no air in it; pour a little kerosene onto the water. Put the tube in the light.

11.2 Leave the 4 test-tubes until your next lesson. The experiment will show us which of the conditions - <u>air</u>, <u>light</u> and <u>water</u> - a seed needs to germinate. Make a list of the conditions in each of the test-tubes that you have set up.

Which test-tube is the control for the experiment ? Explain your answer.

11.3 Now look at a seed that has been soaked in water for one day. Describe what has happened to it, and suggest how this has happened.

11.4 Carefully open up the seed. In your book, make a drawing of its internal structure. Label your drawing - you will be able to see the food store, the embryo plant and the seed coat.

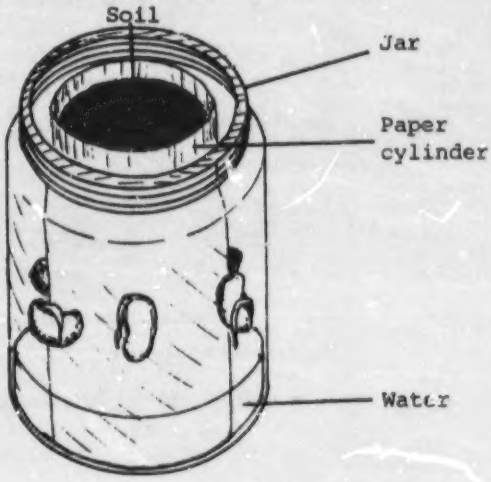
11.5 Test the food store of your seed to find out which types of food it contains. Describe what you did to test the seed. Record and explain the results that you get.

GERMINATING SEEDS

11.6 Look back at your experiment 11.1. By looking at which seeds have germinated, you can say which conditions the seeds needed to germinate.

11.7 Make a "growing pot" for some seeds, so that you can study how they grow.

Make a cylinder of paper so that it just fits into a jar or beaker. Fill this cylinder with soil and water it. Push some soaked seeds down between the paper and the jar.



11.8 Leave the jar for a few days. Look at the seeds in it as often as you can. Make notes and drawings to describe how they grow, and try to answer these questions: -

(1) Which is the first part to grow out from the seed ?

(2) Is it important to plant the seed the right way up ? Give a reason for your answer.

(3) What happens to the food store as the seedling plants grow bigger ?

(4) When are the seedling plants first able to photosynthesise ?

Your teacher may allow you to transplant your seedlings into the agriculture project.

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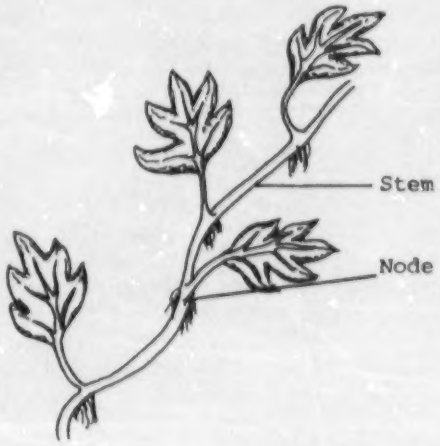
UNIT 7

PROJECT 2

VEGETATIVE REPRODUCTION

12.0 It is not always possible to grow plants from seeds. Some plants have other ways of reproducing which we can use when we grow crops.

12.1 Take a "stem cutting" from a sweet potato. Your piece of stem should have 4 or 5 nodes on it. (A node is the place on the stem where the leaf is, or was, attached.)

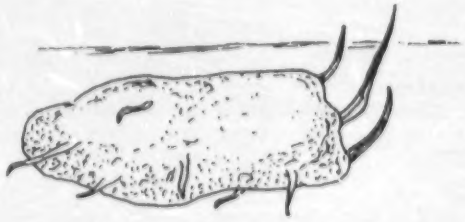


Plant your cutting in well watered soil in a ridge. Look at it every few days and record how well it grows.

You may also try planting cuttings of pumpkin and cassava.

12.2 You may also try to plant a sweet potato tuber. The tuber is a part of the root of the plant which stores food.

Test a piece of a sweet potato tuber to find which types of food it contains. Record and explain your results.



12.3 New plants grow from the "eyes" of the tuber. How many young plants do you think will grow from a cutting, and how many from a tuber ? Discuss which you think you should plant.

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